Feasibility studies of proton electromagnetic form factors with the $\bar{\text{P}}$ANDA detector

Dmitry Khaneft

University of Mainz

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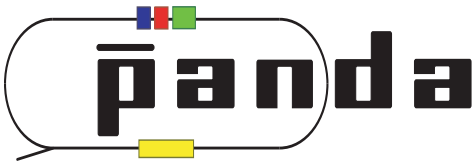


Outline

Monte Carlo Simulations

Signal: $\bar{p}p \to e^+e^-$

- $p(\bar{p}) = 1.7[GeV/c] \to s = 5.4[GeV/c]^2$
- $p(\bar{p}) = 3.3[GeV/c] \to s = 8.2[GeV/c]^2$
- $p(\bar{p}) = 6.4[GeV/c] \to s = 13.8[GeV/c]^2$
- $-1.0 < \cos\theta_{CM} < 1.0$
- $G_E/G_M = 0, 1, 3$
- $N = 10^6$
- PHOTOS *on*/*off*

Monte Carlo Simulations

Background: $\bar{p}p \to \pi^+\pi^-$

- $p(\bar{p}) = 3.3[GeV/c] \to s = 8.21[GeV/c]^2$
- $-0.9 < \cos\theta_{CM} < 0.9$
- $N = 10^8$

PID algorithms

PID algorithm:

- PidAlgoEmcBayes
- PidAlgoDrc
- PidAlgoDisc
- PidAlgoStt

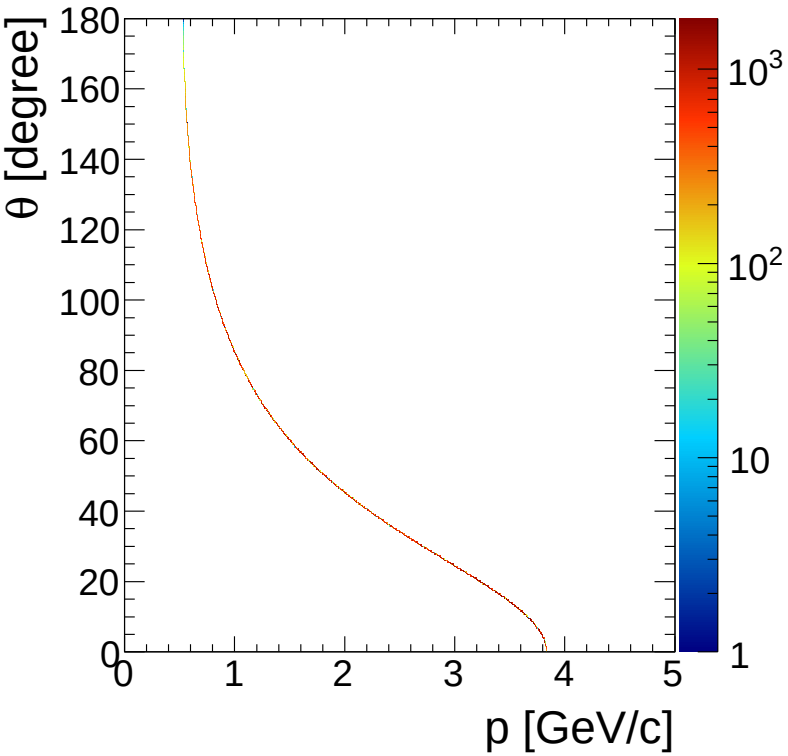
$P(e^{\pm}) > 99.9\%$

Selection criteria

- The event must have only one positive and one negative particle after reconstruction
- Reconstructed track must NOT hit muon detector
- For both the positive and the negative particle, $E/p > 0.8$ [(GeV)/(GeV/c)]
- $dE/dx_{STT} > 5.6[KeV/cm]$
- Common vertex $-1 < X, Y, Z < 1mm$
- Energy and momentum conservation within resolution of 20%
- Number of crystals fired in the EMC < 5

Monte-Carlo output for e^+e^-

PHOTOS **off**



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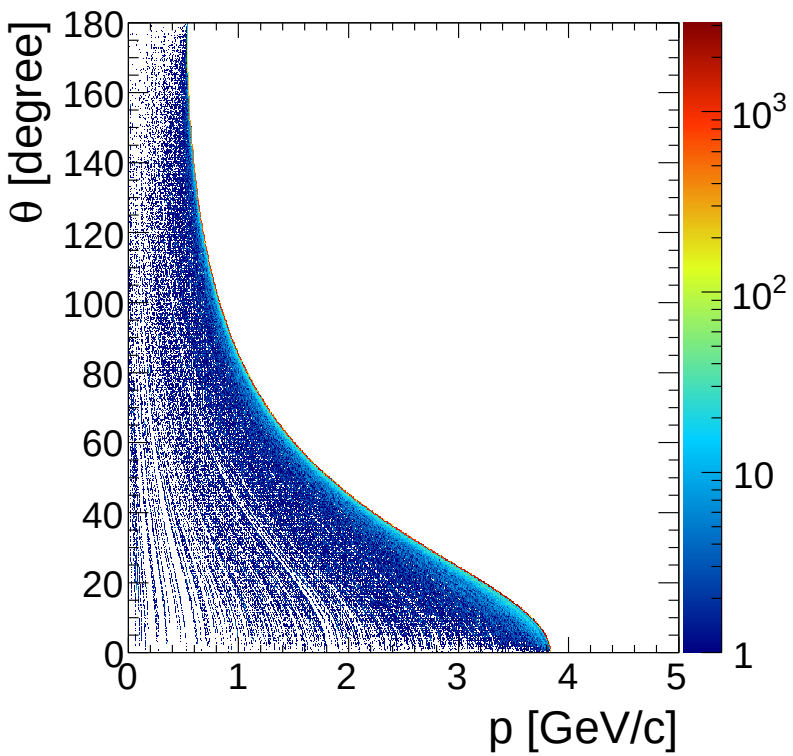
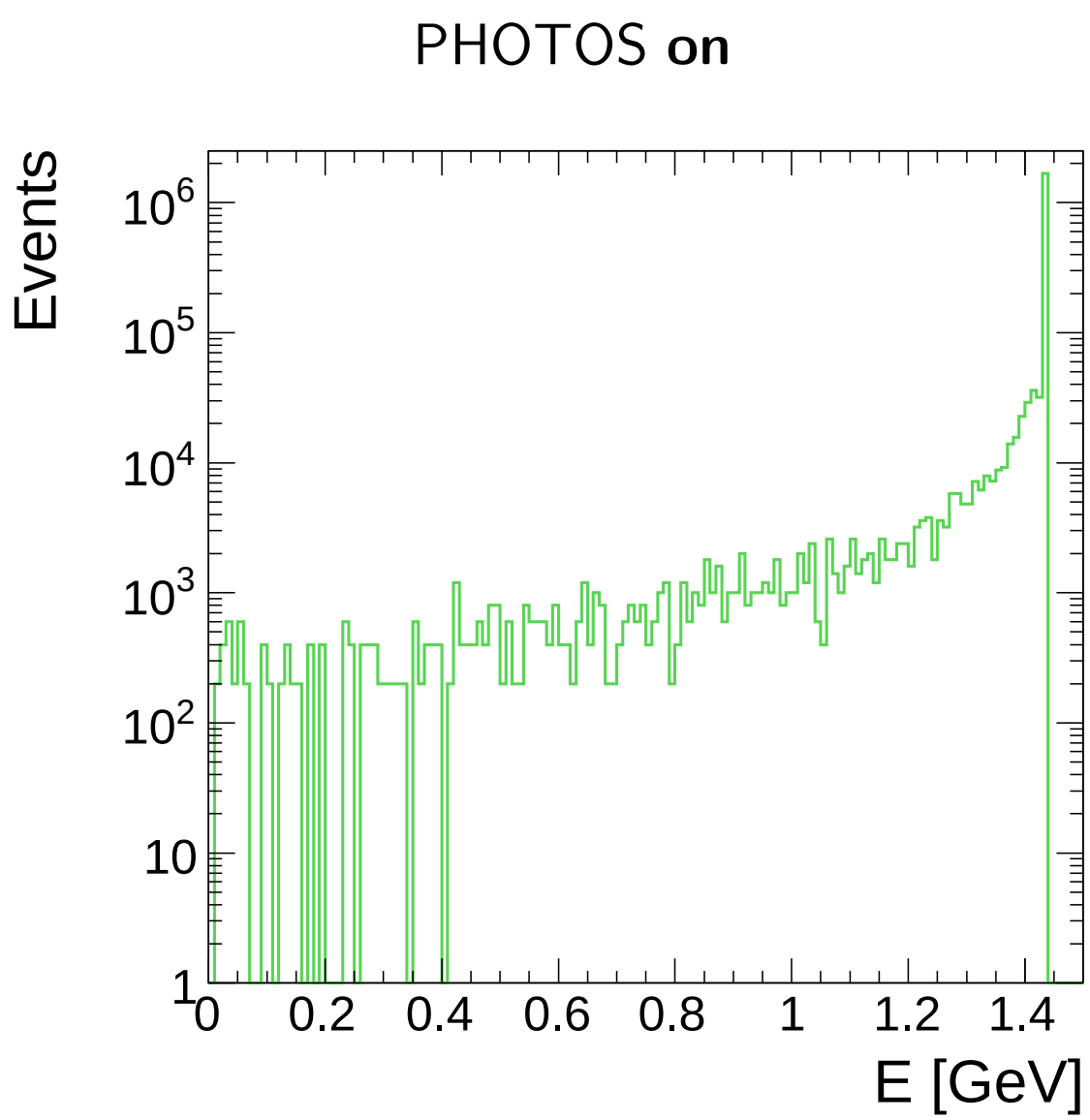
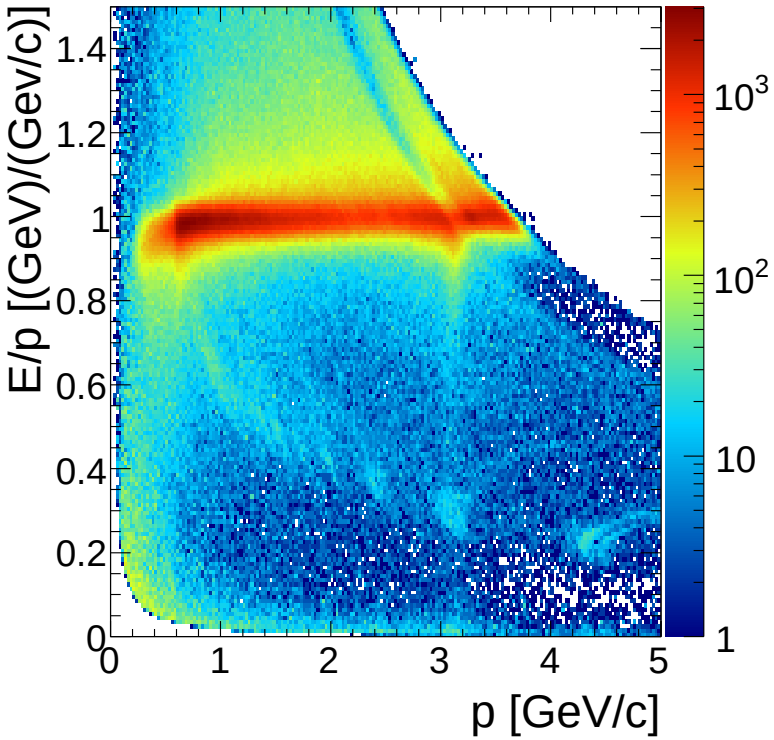


Monte-Carlo output for e^+e^-

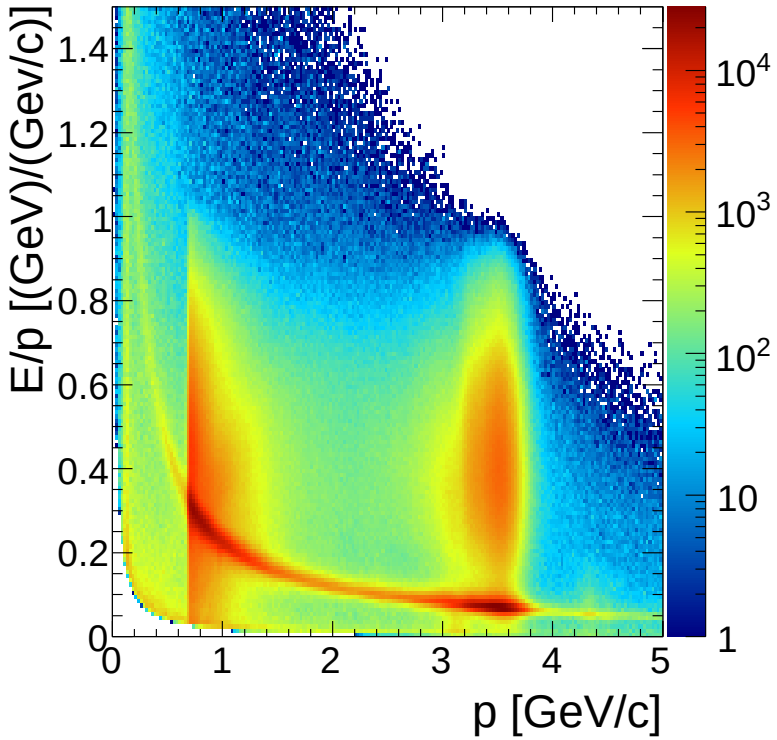


E/p vs p

e^+e^-

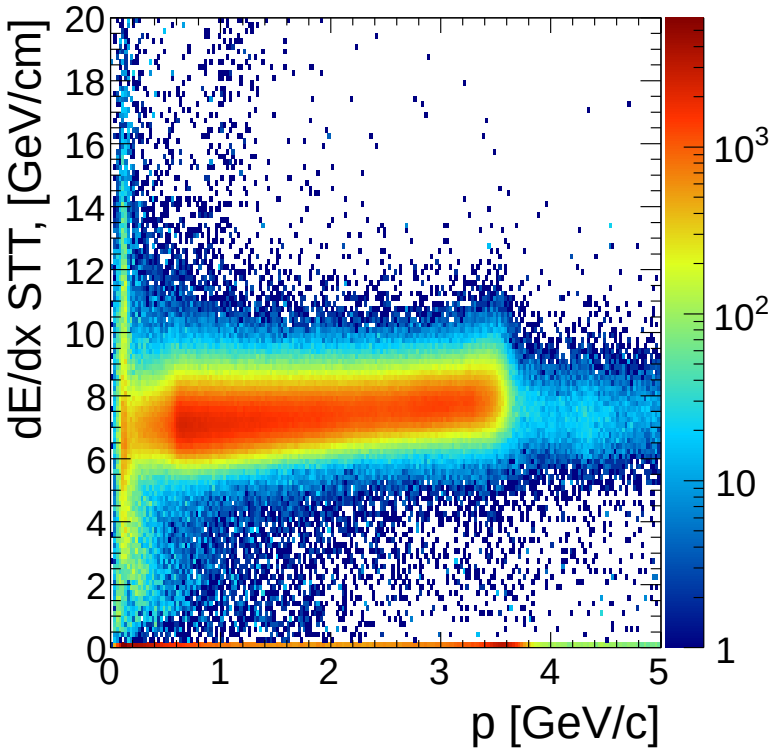


$\pi^+\pi^-$

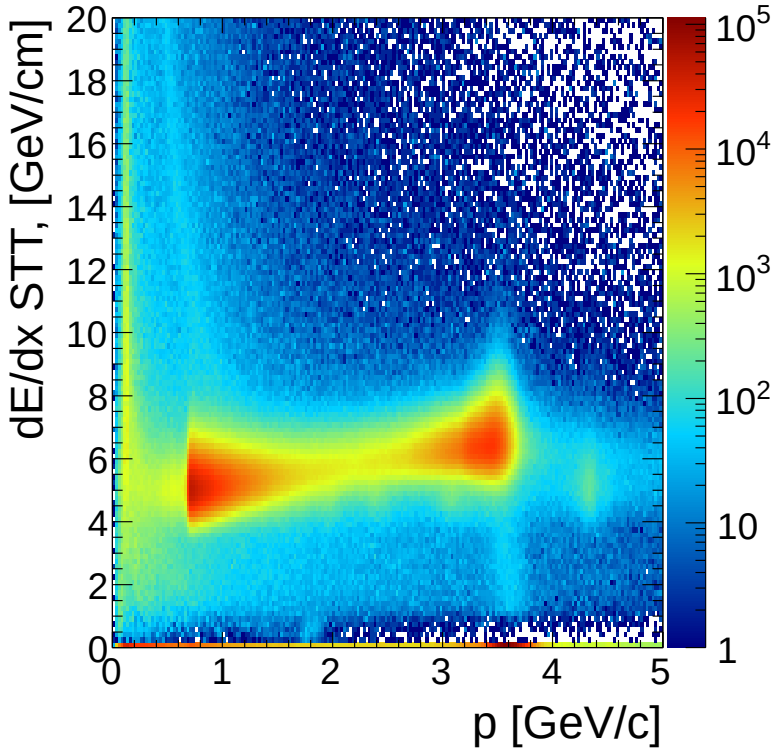


dE/dx_{STT}

e^+e^-

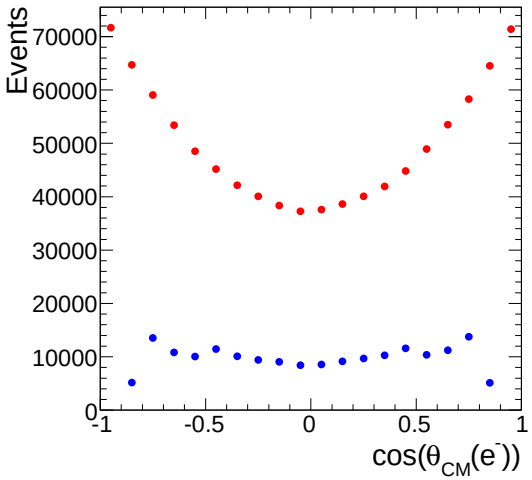


$\pi^+\pi^-$

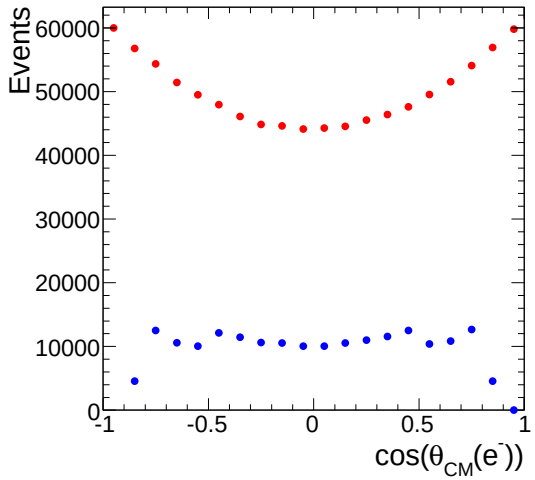


Angular distribution for e^+e^-

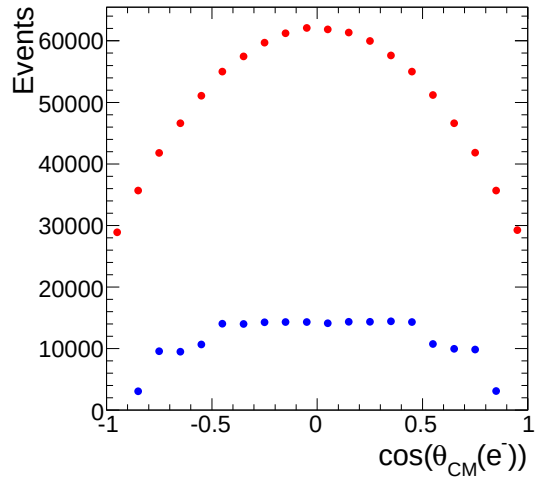
$G_E/G_M = 0$



$G_E/G_M = 1$



$G_E/G_M = 3$



- Monte-Carlo
- Reconstructed

Reconstruction efficiency of e^+e^- and $\pi^+\pi^-$ pairs

	$\bar{p}p \to e^+e^-$			$\bar{p}p \to \pi^+\pi^-$
G_E/G_M	0	1	3	-
$p_{beam} = 1.7\ [GeV/c]$	22.5%	23.5%	25.7%	-
$p_{beam} = 3.3\ [GeV/c]$	17.7%	18.6%	21.0%	0.0%
$p_{beam} = 6.4\ [GeV/c]$	11.0%	11.5%	13.6%	-